

# Perception of Key Informants on Climate Variability, Livestock Diseases, Herd Mobility and the Adaptation Strategies of Local Pastoralists in Samburu County, Kenya

G. L. Lelenguyah<sup>1</sup>, M. M. Nyangito<sup>2</sup>, O. V. Wasonga<sup>2</sup>, R. C. Bett<sup>3</sup>

<sup>1</sup>State Department of Livestock, Ministry of Agriculture, Livestock, Fisheries and Cooperatives, Nairobi, Kenya

<sup>2</sup>Department of Land Resource Management and Agricultural Technology, University of Nairobi, Nairobi, Kenya

<sup>3</sup>Department of Animal Production, University of Nairobi, Nairobi, Kenya

## ABSTRACT

The projected global temperature increase, more intense rainfall and more frequent droughts will have devastating effects on pastoral livelihoods. An understanding of the perception of environmental changes by the key stakeholders is an important element in the planning for the sustainable responses and management of the same. Pastoralist communities are known to manage their vast grazing territories and exploit resource variability through strategic mobility of the herds. However, the knowledge on which pastoralists' resource management techniques are based on and their perception of the key issues affecting herd mobility has received limited attention. The aim of this study was to investigate key informants' perception on the impacts of climate variability on the livelihoods of the pastoralists. This study utilized key informant interviews. A total of 22 key informants were interviewed and included veterinary officers, livestock officers, veterinary drugs outlets and other key stakeholders from each of the three Sub-counties of Samburu County. Data from key informants was qualitatively analyzed in themes and sub-themes. A number of observations were made including the changing climate conditions, its effects on the pastoralists and the coping strategies employed. The effects of the changes mentioned included loss of livestock, increase in disease incidences and frequency of migrations, among others. The study recommends Continuous vaccination of livestock to minimize disease recurrence, routine dipping and controlled movement of herds to minimize conflicts. Other recommendations are creating awareness campaigns on disease surveillance during mobility, establishing of grazing management committees, provision of drugs and creation of more livestock treatment stations and vaccination of animals before entry into affected areas.

**KEYWORDS:** Pastoralists' perception, Climate variability, Droughts, Floods

## 1. Background

Climate variability and change have continued to affect pasture and water availability within the rangelands that the pastoralists depended on for thousands of years (GoK, 2017; Wasonga *et al.*, 2011; Fer *et al.*, 2017; Mcsweeney *et al.*, 2010; Lelenguyah *et al.*, 2014). This has resulted to continuous mobility of pastoralists with their herds in search of these scarce resources (Adriansen, 1999;

Ellis and Galvin, 1994). Since the availability of these resources dictate their movement patterns, pastoralists from different ethnic groups have always found themselves converging and competing for the same resources (Lengoiboni, 2011; Mulianga, 2009). This has often resulted in resource-based conflicts and also led to spread of livestock diseases. In the study area for example, the morbidity cases for CCPP and PPR

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in 2015 were 15% and 11% respectively while the mortality cases for the two diseases were 10.17% and 6.17% respectively (CDVS, 2015). Livestock, especially sheep and goats, are crucial in supporting pastoral livelihood security within pastoral areas. However, given the extensive production system practiced in the rangelands characterized by extensive herd mobility and coupled with weak disease control initiatives, this critical asset is under threat from a myriad of trans-boundary diseases such as CCPP, sheep pox, goat pox, PPR among others. Specifically, PPR is a widespread, virulent and devastating to small ruminants. Across the adjoining Counties of Turkana, Samburu, West Pokot and Baringo, their County livestock development plan for 2013 – 2017 cite high disease and pest prevalence as causing heavy livestock losses and a major challenge in livestock production.

Despite the disease challenge and the continued loss of animals, little or no attention has been directed towards getting solutions to pastoralism-related livestock disease outbreaks and their control. Particularly, the nexus between climate variability and herd mobility in creating livestock disease hotspots has not been analysed to spur targeted disease control measures in these poorly inaccessible pastoral landscapes. It is through the understanding, characterization and documentation of these hotspots that proper livestock disease control measures can be put in place. This study intended to investigate the patterns of herd mobility and resource use with the variable climate, its impact on livestock disease control and consequently propose disease control interventions and strategies for Northern Kenya that will ensure that climate variability and herd mobility does not become a constraint to livestock disease control.

This study utilized key informant interviews in trying to understand the level of vulnerability of pastoralists to climatic variability. The study particularly focused on the three Sub-counties of Samburu County, Kenya.

## 2. Methodology

### 2.1. Study Area

Samburu County covers an area of approximately 21,022.01km<sup>2</sup>. It is a Semi-arid rangeland which lies between latitude 00°30'N – 2°45'N and longitude 36°15' – 38°10'E with altitude averaging to approximately 900m above the sea level (Samburu County Government, 2018). It borders Baringo and Turkana Counties to the west, Marsabit County to the north, Isiolo County to the east and Laikipia County to the south. The County can be divided physiographically into the following major units: Leroghi plateau which rises to over 2000 m, Nyiru

and Ndoto mountains and Mathews ranges of altitudes ranging between 1,500 and 2500 metres according to a report compiled by Samburu County Government and World Food Program (SCG & WFP, 2015). There is also the eastern flank of the great Rift Valley and the plains with its slopes towards Lake Turkana, Isiolo and Marsabit, which ranges in altitude from between 1000 to 1350 metres. The climate of the County varies with altitude. The average annual rainfall can go below 400 mm in the lowlands to above 1250 mm in the mountains (SCG & WFP, 2015). Eight percent of the County is classified as high rainfall with adequate moisture to support arable agriculture. The rest of the County is classified as rangeland.

### 2.2. Research Design and sampling procedure

The study utilized non-probability sampling technique. Purposive sampling was used to determine a sample for institutional survey. This non-probability sampling technique allows the investigator to rely on his/her expert judgement to determine representative units. This study involved interviewing of 22 key informants in both public and private sectors at either the County or Sub-County levels. The institutions selected for key informant interviews included Veterinary (3), Livestock (3), Agriculture (3), National Drought Management Authority (1), Special Programs (3), County Livestock Marketing Council (CLMC) (1), FAO (1), CARITAS (1), Veterinary drugs outlets (3) and Sub-County administration (3). However, the choice of the institutions and the key informants was purposive, mainly based on the relevance of the institution and the role of the key informant in the community under study.

### 2.3. Statistical Methods and Analysis

Data from key informants was qualitatively analyzed in themes and sub-themes as described by Maguire and Delahunt (2017). Key informant interviews using a questionnaire checklist were conducted with all heads of veterinary services of the three Sub-counties and other key stakeholders. The checklist assessed all the attributes including changes in weather parameters, livestock disease outbreaks as well as the coping strategies of the pastoralists and the support services provided by the specific organizations.

## 3. Results

The results of this study have been presented in form of themes and sub-themes as described by Maguire and Delahunt (2017). The presented results has focused on each of the key informant interviews questions that was asked during the research process. The following are the results of this study.

### 3.1. Changes experienced in the trend of the climatic variables over the last 20 years (Jan. 1999 to Dec. 2019)

#### 3.1.1. Temperature

The respondents noted that there have been a lot of changes. Temperatures are becoming warmer. More heat is being experienced now during the day time and very few cold nights compared to before. The year 2016 was said to have been the hottest year. Temperature was also said to have become very high during dry season and fall below normal in wet season. Very high temperatures were also observed in 2002 and 2007 according to one of the respondents. This has been fluctuating where the normally perceived hot seasons of the year becoming hotter while the cold seasons become colder. Some of the respondents noted an increased diurnal range i.e. high temperatures during the day and very low at night. Highland areas like Maralal was said to have been very cold but warmer now.

#### 3.1.2. Rainfall

The rains were said to have become quite erratic with a major shift in time of onset of rains from March being observed from early 2000. Frequency has also reduced with a lot of inconsistencies and little amount of attributed to climate changes. Unexpected above normal rains have often occurred and sometimes a total failure of rains. Some respondents observed that the highest was received in 2019, 2010 and 2013. It was observed that rainfall patterns have changed, they are no longer predictable thus causing problems to pastoralists. The rains has been unpredictable and either inadequate or sometimes in excess. Rainfall was said to have been declining between 1999 and 2019. It was noted that, it no longer follows the historical patterns of March-April-May and October-November-December.

#### 3.1.3. Drought

Increased recurrence of rainfall was noted by the respondents with some saying that droughts are experienced approximately every 1-2 years. There was a general observation among the respondents that the periods between droughts have narrowed down to 1-2 years unlike previously where it occurred once in ten years. It was observed that severe droughts were experienced in 2002 and 2007 due to lack of enough rains. Other years that droughts were observed included 1999/2000; 2005/2006, 2008/2009; 2016/2017 and inadequate rains in between. What was referred to as a mini drought was also said to have occurred in 2013/2014. Generally, drought frequency has been on an increase over time and cases of prolonged droughts caused by failure of two consecutive rainfall seasons leading to serious drought.

#### 3.1.4. Floods

Floods were said to have increased because of land degradation. Respondents mentioned flash floods have occurred causing property and livestock losses mostly experienced during El nino and extended long rains. Although floods were said to be uncommon in Samburu County, it was reported being experienced in 2010, 2013 and 2016 in some parts of the County. The frequency of floods was noted to have increased drastically and exacerbated by land degradation. Floods was only said to be affecting only a few pockets of Samburu County and mainly occurs along major rivers including Ewaso Nyiro, Seyia, Nagor-Oworu, Barsilinga and Lengusaka.

### 3.2. Effects of the changes on the livelihoods of the pastoralists

The key informants mentioned increased incidences of diseases, poverty levels and vulnerability as some of the effects of the changes.

*"Recurrence of conflicts has increased over pasture due to reduced grazing land and pasture. Conflicts have increased as people compete for limited resources, the animals are forced to trek for longer distances resulting to increased pests and diseases. Poor harvests and losses due to untimely rain seasons leading to food insecurity. Loss of life of livestock, crops and properties as a result of floods".* **Sub-County Agriculture Officer (Samburu Central, Kenya)**

Livestock losses during droughts lead to increase in poverty levels. Above normal rains was said to have led to diseases like Rift Valley fever and Blue tongue hence exacerbating further loss of animals. There has been increased migrations of animals from one place to another in search of pasture and water. Pastoralists livelihoods system was also noted to have changed since most of the times they are constantly on the move looking for pastures and water for their animals. These has also affected them economically and socially. Loss of vegetation cover was said to have lead to land degradation through soil erosion resulting into bare land. Loss of human lives and properties every raining seasons as a result of floods as well as loss of livestock during periods of drought disease outbreaks was said to have led to pastoral drop outs which results to poverty at the household level. Many households were reported to have dropped from pastoralism to new trades including employments, petty trade and charcoal burning. Increased land degradation was blamed for poor regeneration of pastures resulting to less feed availability for livestock. The observed changes was also blamed for reduced purchasing power leading to reduction in number of meals consumed in a day,



engagement in alternative livelihoods such as charcoal burning, increased dependency and increased school dropout rates. The old and children suffer most through malnutrition. Pasture and browse have reduced causing conflicts leading to loss of livestock and human lives. Increased drought incidences has also lead to depletion of natural resources (water and pastures) resulting to low livestock productivity and at times livestock mortalities due to frequent livestock movements.

### 3.3. Link between livestock disease outbreaks and climate variability

Although most of the livestock diseases were not directly linked to climate variability, frequent migrations of animals was blamed for the occurrence of most of the diseases. This is because these climatic changes lead to livestock movement from one area or Subcounty to other areas, Sub-counties or Counties. FMD is transmitted when animals move from one area to another in search of pasture. PPR was said to be a new disease associated with emerging trends in climate change. Blue tongue and RVF were noted to occur after above normal rains leading to flooding events while CCPP and foot rot were said to mostly occur during the rainy season.

### 3.4. Determinants of herd mobility patterns each year

The major determinant of herd mobility was said to be the amount of rains received in a particular area. If, for instance, the wet season has not received sufficient rains around the homesteads then there is increased mobility. According to the key informants, the pastoralists have become accustomed to their own seasonal calendar that they tend to follow. During wet seasons all animals are driven back home while during dry seasons, they move to the dry season grazing areas. The unpredictable weather patterns has resulted in the interruption of the normal rainfall cycle. Generally, herd mobility patterns are dependent on availability of pastures and water

### 3.5. Challenges of livestock diseases during herd mobility

The key informants acknowledged the fact that livestock diseases has become a major challenge during herd mobility. As livestock interact from different localities, they transmit diseases to each other. This is because livestock from different areas converge and thus incidences of diseases increase. There's also incidences of diseases being transmitted between sick herds and healthy herds especially at water points. Despite the increased incidences of livestock diseases during herd mobility, the veterinary drug outlets reported low demand for veterinary drugs during these periods. This could mean that when

animals move far away from the homesteads, there's less focus on their health due to decreased purchasing powers at the household level. The disease challenge during herd mobility lowers the productivity of livestock thus affecting their market value. Insecurity also occurs as a result of livestock diseases. Moving to other areas increases insecurity due to conflicts between communities. Even as the risk of disease transmission increases in the dry season grazing areas, the key informants from veterinary department observed that controlling diseases during these periods also poses another major challenge. This is especially so due to the vastness of the area as well as lack of accessibility to where livestock graze and also insecurity challenges.

"Its a big challenge controlling diseases during herd mobility considering the inter-County nature of migrations. Also some of the areas are hard to reach and veterinary service provision becomes a challenge". **Sub-County Veterinary officer (Samburu North)**

Major migrations always results to major disease outbreaks. Such outbreaks results during such periods leading to closure of markets to curb further spread.

Apart from livestock diseases, other challenges that were mentioned by the key informants included animals feeding on crops and pastures in private farms resulting to with crop farmers, increase in petty theft, and reduction household income. When the animals were away from home, households were said to be unable to buy farm inputs for crop production and pay for cost of cultivation. Influx of livestock from other areas was also said to have lead to low market prices.

### 3.6. Local community coping strategies to diseases and other challenges

The respondents mentioned a number of coping strategies employed by the pastoralists when faced with diseases and other challenges. They included sell of their animals and buying drugs, appealing to the government for support, destocking weak animals and reporting to local leaders for example chiefs or community disease reporters trained by livestock department. In addition, the key respondents also mentioned imposition of quarantine in specific grazing areas and watering points, treatment with drugs from the veterinary outlets, use of ethno-veterinary medicine and vaccinating their livestock before and during outbreaks.

*"The community cope through self-administration of veterinary drugs without seeking professional services and most cases let these diseases take a natural course".* **Sub-**

### County Special Programs Officer (Samburu East)

Herd splitting to make them manageable was also said to be a coping strategy during herd mobility. During disease outbreaks, the pastoral community also seeks support from veterinary department. Other coping strategies noted by the key informants included peace dialogues through community barazas, migration to safer areas, fencing off of land, use of acacia pods and deferred movement to grazing areas, controlled grazing patterns and observing weather and climate patterns. Generally, the respondents observed that communities have become resilient to these challenges.

### 3.7. Organizations' interventions during disease outbreaks

The key informants being the representatives of the selected organizations mentioned a number of interventions that they provide during disease outbreaks. Such interventions included provision of logistical support to the veterinary department for instance by providing funds for during disease surveillance and mass vaccinations, treatments, quarantines and livestock movement control, advising livestock owners, availing essential drugs to the livestock keepers, organizing outreach services and providing relief food to the communities. The NDMA has also developed an early warning systems used to train pastoralists on risk reduction. The veterinary department has also been doing capacity building on identification of diseases, surveillance and giving treatment at the village level.

*"Other partners has been facilitating the procurement of vaccines to support veterinary department while others offer logistical support. Veterinary department has also been intervening through ring vaccinations, advising herders on the right drugs to be administered to various diseases, mass vaccinations either supported by county government or by other development partners and also advising farmers through offering extension services".* **County Director of Veterinary Services (Samburu County, Kenya)**

Some of the partners, work in collaboration with livestock department towards the control of livestock diseases through community sensitization, facilitating grazing plans, water provision, facilitating community dialogues and peace meetings, livestock offtake, offering supportive treatments and supplementary feeds during drought periods.

### 3.8. Factors that determine how and when different organizations intervenes in disease control

A number of factors was mentioned by the key informants to be the key determinants of the

organizations' interventions. Among them are the length of the dry season, whether or not the situation calls for emergency intervention, availability of funds, partnership with relevant personnel during disease occurrence, size of the organization's budget allocation and procurement delays. Other factors included availability of transport, availability of resources (vaccines, facilitation allowances for the staff, vehicles and fuels, and adequate cold chain facilities), willingness of the farmers to accept their animals to be vaccinated and how well the communities/farmers have been mobilized to increase vaccines uptake and coverage. In addition, accessibility of the area by road, weather patterns (for instance during rainy seasons it is a challenge to do any interventions), migration patterns, incidences of disease outbreaks reported, stage of drought (Normal, alert, alarm or emergency), security status of the area and availability of partners support towards disease control interventions.

### 3.9. Ways that livestock diseases can be controlled/treated during mobility

A number of suggestions were made on how best to control or treat livestock diseases during mobility. These included minimizing migration, development of disease free zones, continuous vaccination to minimize disease recurrence, routine dipping, arrange herders to move in specific direction to minimize conflicts, creating awareness campaigns on disease surveillance during mobility and establishing of grazing management committees.

*"I strongly advocate for provision of veterinary drugs and creating more livestock treatment stations, vaccination before entry into affected areas or preventive antibiotic therapy, weekly spraying to control ticks, providing prophylaxis drugs during herd mobility, isolating the sick animals from the rest of the heard and through mass vaccinations. This will ensure reaching out to large numbers of livestock".* **Sub-County Veterinary Officer (Samburu East, Kenya)**

Finally, restricting movement of herds by zoning the areas to be grazed, informing authorities in advance about the migrations, regular vaccinations, inter-County cooperation in disease control, understanding the livestock movement patterns and treating/vaccinating them at the specific sites, avoiding concentration of livestock in one area, supportive treatments, encouraging the use of ethno-medicine and ensuring the herders move to accessible areas during disease control was also suggested by the key informants.

#### 4. Discussion

There was a general observation among the key informants that the rainfall trend has been erratic with episodes of extremely heavy rains. This observation is shared by the UNDP's climate change profile for Kenya which noted that rainfall observations since 1960 has not shown any statistically significant difference (McSweeney *et al.*, 2010). This report further noted that heavy rainfall events have been increasing with no statistically significant trend. The respondents noted that in Arsim area heavy rainfall events has continued to be experienced in the area since 2011 when excessively heavy floods were experienced in the area.

The key informants noted that the effects of floods dominated among the various factors that resulted in the displacement of the households in Arsim. Most of the households in Arsim area have settled along the rivers flowing from Ndoto Mountains which floods during extremes of climate variability particularly during heavy rainfall events. The floods in the affected areas always result to population displacement, loss of lives and emergence of water-borne diseases.

Temperature and droughts were said to have been increasing and more severe over the study period respectively. Other environmental variables including vegetation were said to have been increasing. However, of the climatic variables, only rainfall is perceived to decline in future while temperature, drought and floods could possibly increase in future according to the respondents. At the global scene, temperature is expected to rise by between 1.0°C and 3.5°C by 2100 (Githeko *et al.*, 2000).

The trend of ticks and mosquitoes was perceived to be an upward one by most of the respondents. On the other hand, the trend of other biting flies were said to be on the decline while that of tsetse flies was said to be constant. According to Githeko *et al.*, 2000, the changes in temperature, rainfall and humidity affects the ecology and biology of vectors hence such effects could either increase or decrease the population of vectors. However, land use changes could also have contributed to the decline in the abundance of other biting flies in these area as perceived by the respondents. According to them, there has been increased bush clearing in Ngutuk Engiron, Lonyangaten and Longewan for either farming activities, pasture production or just for other economic activities including charcoal burning hence these could also have contributed to changes in the abundance of these vectors. The cultivation and bush clearing activities destroys the habitat for vectors hence leading to decrease in their numbers (Yatich, 1995).

Of the veterinary diseases under investigation, only trypanosomiasis and camel pox were reported to have been on the decline over the study period. All others including FMD, CCPP and PPR were perceived to be on the increase. The risk of disease transmission is increased by the changes in biology and ecology of vectors (Githeko *et al.*, 2000) and this could be the major contributing factor in the increasing trend of diseases over the study period. The aspect of weather also comes into play when dealing with disease outbreaks because weather condition is known to affect both the timing and the intensity of the outbreaks. This is true particularly when it comes to CCPP.

Pasture availability was the most important factor that determined where pastoralists will move their animals according to the respondents. Others were water availability, conflicts, type of livestock kept and emergence of livestock diseases in that order.

Livestock diseases are a challenge during herd mobility. Some of the diseases that were mentioned by the respondents to be a challenge during herd mobility were Heartwater, Sheep and Goat pox, Anaemia, Black quarter, Diarrhoea, LSD and ECF. Others were Redwater (Babesiosis), Camel pox, Trypanosomiasis (Nagana), PPR, FMD, Enterotoxaemia, Anaplasmosis, Worms, 3-days fever and Foot rot.

The respondents provided a number of responses with regard to the effects of diseases on livestock and the household during mobility. The effects listed by the respondents included affecting food availability and food security at household level, results to poor health and death of animals, restricts mobility, causes infertility of the affected livestock and results to loss of weight. Other effects of diseases on livestock during mobility were low reproduction, poor quality products, reduces number of livestock, poor quality and quantity livestock products (milk, meat), transmission of diseases to humans and weak and unhealthy animals.

A number of coping strategies to reduce the effects of livestock diseases were mentioned by the respondents including buying of drugs to treat sick animals, moving the animals to areas not affected by diseases, killing the affected animals to avoid spread of diseases, calling veterinarians and reporting disease outbreaks. Other coping strategies included controlled movements, herbal treatment, Isolation of the sick animals, killing the affected animals, report to the area disease reporter, migrate to unaffected areas, quarantining the sick animals and restricting livestock movement.



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